Disappearance of Dijets in Central Au+Au collisions at RHIC

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In p+p collisions, large transverse momentum hadrons are produced primarily through large momentum transfer elastic scatterings of partons and subsequent fragmentation into jets. At RHIC, the center-of-mass energy is sufficient that this production mechanism may be important in nucleus-nucleus collisions. Because of the large multiplicities in a nucleus-nucleus collision direct jet identification is difficult on an event-by-event basis. Instead, we search for statistical evidence of jet production using two-particle azimuthal correlations among high p_T hadrons. First results from Au+Au collisions at $\sqrt{s} = 130$ GeV produced small-angle azimuthal correlations consistent with those expected from jet production[1]. Comparing the higher statistics $\sqrt{s} = 200$ GeV Au+Au data to p+p reference data we have confirmed that the near-angle azimuthal correlations are indeed from jet production and made quantitative comparisons of near-angle ("jet-like") and back-to-back ("dijet") correlations in Au+Au and p+p collisions.

FIG. 1: High p_T azimuthal distributions from Au+Au collisions compared to a p+p plus elliptic flow reference.

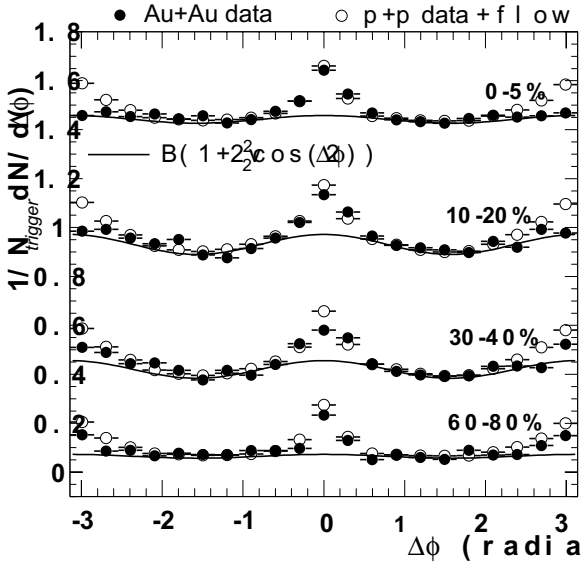

Fig. 1 shows the measured high p_T dihadron data compared to a reference distribution expected in the absence of nuclear effects on jet production. The reference consists of a superposition of the measured p+p data and dihadron pairs with global correlations due to elliptic flow. The near-angle correlations ($\Delta\phi \approx 0$) measured in all centralities of Au+Au collisions are qualitatively consistent with the reference model, confirming that the particle production mechanism for large transverse momentum hadrons is similar in p+p and Au+Au collisions. We have also demonstrated that these near-angle correlations show the charge ordering expected from jets [2]. The back-to-back dihadron correlations ($\Delta\phi \approx \pm\pi$) are present in both the p+p data and the peripheral Au+Au collisions. In the most central Au+Au collisions, the back-to-back dihadrons are absent. The absence of back-to-back dihadrons suggests that the observed high p_T hadrons come from partons produced on the periphery of the collision zone, while the recoil parton (jets are nearly always produced in pairs) is absorbed or rescattered in the medium. This is consistent with a "Jet Quenching" scenario.

[1] STAR, Phys. Rev. Lett. 90, 032301 (2003).
[2] STAR, Phys. Rev. Lett. 90, 082302 (2003).